

THE
DESIDERATUM:
OR,
ELECTRICITY

Made PLAIN and USEFUL.

By a Lover of Mankind, and of Common Sense.



BRISTOL:

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1. **I**N the following tract, I have endeavoured to comprize the sum of what has been hitherto published, on this curious and important subject, by Mr. *Franklin*, Dr. *Hoadly*, Mr. *Wilson*, *Watson*, *Lovett*, *Freke*, *Martin*, *Watkins*, and in the *Monthly Magazines*. But I am chiefly indebted to Mr. *Franklin* for the speculative part, and to Mr. *Lovett*, for the practical: tho' I cannot in every thing subscribe to the sentiments either of one or the other.

2. Indeed I am not greatly concerned for the philosophical part, whether it stand or fall. Of the facts we are absolutely assured: altho' they are of so surprizing a nature, that a man could not have asserted them a few years ago, without quite giving up his reputation. But who can be assured of this or that hypothesis, by which he endeavours to account for those facts? Perhaps the utmost we have reason to expect here, is an high degree of probability.

3. I am much more concerned for the physical part, knowing of how great importance this is: how much sickness and

pain may be prevented or removed, and how many lives saved by this unparallel'd remedy. And yet with what vehemence has it been opposed? Sometimes by treating it with contempt, as if it were of little or no use: sometimes by arguments, such as they were; and sometimes by such cautions against it's ill effects, as made thousands afraid to meddle with it.

4. But so it has fared with almost all the simple remedies, which have been offered to the world for many years. When Sir *John Floyer* published his excellent book on *cold-bathing*, many for a time used and profited by it. So did abundance of people by *cold water*, when it was publickly recommended by Dr. *Hancock*. The ingenious and benevolent Bishop of *Cloyne*, brought *Tar-water* likewise into credit for a season: and innumerable were the cures wrought thereby, even in the most desperate and deplorable cases. Nor was it a little good which was done by the use of *Sea-water*, after Dr. *Russel* had published his tract concerning it. Indeed each of these did wonders in its turn. But alas! their reign was short. The vast party which were on the other side, soon raised the cry, and ran them down. In a few years they were out of fashion, out of use, and almost out of memory: and the foul, hard named *Exotics* took place again, to the utter confusion of common sense.

5. Must not *Electricity* then, whatever wonders it may now perform, expect soon
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to share the same fate? And yet it is absolutely certain, that in many, very many cases, it seldom or never fails. "I can truly say, (says Mr. *Lovett*) I scarce ever knew any who made the trial and did not succeed. Not that all disorders will yield thereto. Neither in this any more than the common way, will the same treatment of the same disorder in different persons have always the same success." Indeed there cannot be in nature any such thing as an absolute *Panacea*: a medicine that will cure every disease incident to the human body. If there could, Electricity would bid fairer for it, than any thing in the world: as it takes place in such a vast number of disorders, some of them so widely different from the others.

6. And yet there is something peculiarly unaccountable, with regard to its operation. In some cases, where there was no hope of help, it will succeed beyond all expectation. In others, where we had the greatest hope, it will have no effect at all. Again, in some experiments, it helps at the very first, and promises a speedy cure: but presently the good effect ceases, and the patient is as he was before. On the contrary, in others it has no effect at first: it does no good; perhaps seems to do hurt. Yet all this time it is striking at the root of the disease, which in a while it totally removes. Frequent instances of the former we have in *Paralytic*, of the latter, in *Rheumatic* cases.

7. But still one may upon the whole pronounce it the *defideratum*, the general and rarely failing remedy, in nervous Cases of every kind (Palsies excepted); as well as in many others. Perhaps if the nerves are really perforated (as is now generally supposed) the electric ether is the only fluid in the universe, which is fine enough to move through them. And what if the *nervous juice* itself, be a fluid of this kind? if so, it is no wonder that it has always eluded the search of the most accurate naturalists.

8. Be this as it may, Mr. *Lovett* is of opinion, "the electrical method of treating disorders, cannot be expected to arrive at any considerable degree of perfection, till administred and applied by the gentlemen of the faculty." Nay then, *quanta despe decidi!* All my hopes are at an end. For when will it be administered and applied by them? truly, *ad Græcas Calendas*. Not till the gentlemen of the faculty have more regard to the interest of their neighbours than their own. At least, not till there are no apothecaries in the land: Or till physicians are independent of them.

9. Therefore, without waiting for what probably never will be, and what indeed we have no reason to expect, let men of sense do the best they can for themselves, as well as for their poor, sick, helpless neighbours, How many may they relieve from racking pain or pining sickness by this unexpensive and speedy remedy? restoring them to
ease,

ease, health, strength, generally in a few minutes, frequently in a moment! And if a few of these lovers of mankind, who have some little knowledge of the animal oeconomy, would only be diligent in making experiments, and setting down the more remarkable of them, in order to communicate them to one another, that each might profit by the other's labour: I doubt not, but more nervous disorders would be cured in one year, by this single remedy, than the whole *English Materia Medica* will cure, by the end of the century.

10. It is not impossible, but the *gentlemen Reviewers* may bestow a compliment on me as well as on Mr. Lovett. If they are so kind, I would only beg them, not to plume themselves upon a discovery, which I have helped them to myself: namely that the following is little more than an extract from others: I intended it so to be. I designed only to collect together the substance of the most celebrated writings on the subject; and to place them in one connected view, for the use of those who have little time or money to spare. I only wish, some who has more leisure and ability than me, would consider it more deeply, and write a full practical treatise on electricity, which might be a blessing to many generations.

Nov. 1, 1759.

T H E

PREFACE

early, healthy, cheerful, and in a few
 minutes, I was in a state of
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 have some little knowledge of the human
 economy, would only be hindered in their
 ing experiments, and being aware of the
 some valuable theory in order to construct
 the theory in the first place, that each
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 the whole history of the disease will cure,
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THE

DESIDERATUM:

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ELECTRICITY made PLAIN.

I. 1. **F**ROM a thousand experiments it appears, that there is a fluid far more subtle than air, which is every where diffused thro' all space, which furrounds the earth and pervades every part of it. And such is the extreme fineness, velocity and expansiveness of this active principle, that all other matter seems to be only the body, and this the soul of the universe. This we might term *elementary fire*; but that it is hard for us to separate the ideas of *fire* and *burning*: altho' the latter is in reality but a preternatural and violent effect of the former.

2. It is highly probable this is the general instrument of all the motion in the universe: from this *pure fire*, (which is properly so called) the vulgar *culinary* fire is kindled. For in truth there is but one kind of fire in nature, which exists in all places and in all bodies. And this is subtle and active enough, not only to be, under the great Cause, the secondary cause of motion, but to produce and sustain life throughout all nature, as well in animals as in vegetables.

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3. To this effect the learned Bishop of *Cloyne* observes, " The vital flame is supposed to be the cause of all the motions in the body of man, whether natural or voluntary. And has not fire the same force to animate throughout, and actuate the whole system of the world? Cherishing, heating, fermenting, dissolving, shining, and operating in various manners, as various subjects offer, to employ, or to determine its force? It is present in all parts of the earth and firmament, tho' latent and unobserved, 'till some accident produces it into act, and renders it visible in its effects."

4. This great machine of the world requires some such constant, active and powerful principle, constituted by its creator, to keep the heavenly bodies in their several courses, and at the same time give support, life and increase to the various inhabitants of the earth. Now as the heart of every animal is the engine which circulates the blood thro' the whole body, so the sun, as the heart of the world, circulates this fire thro' the whole universe. And this element is not capable of any essential alteration, increase or diminution. It is a species by itself; and is of a nature totally distinct from that of all other bodies.

5. That this is absolutely necessary both to feed common fire, and to sustain the life of animals, it seems may be learn'd from an easy experiment. Place a cat, together with a lighted candle, in a cold oven: then lute the door close, having fixt a glass in the middle of it: and if you look thro' this, you may observe, at one and the same instant, the candle goes out, and the animal dies. A plain proof, that the same fire is needful to sustain both culinary fire and animal life: and a large quantity of it. Some doubtless pervades the oven door; but not enough to sustain either flame or life. Indeed every animal is a kind of fire-engine. As soon as the lungs inspire the
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air, the fire mingled with it is instantly dispersed through the pulmonary vessels into the blood: thence it is diffused through every part of the body, even the most minute arteries, veins and nerves. In the mean time the lungs inspire more air and fire, and so provide a constant supply.

6. The air seems to be universally impregnated with this fire, but so diluted, as not to hurt the animal in respiration. So a small quantity of a liquor dropt in water, may be friendly to an human body, though a few drops of the same liquor, given by themselves, would have occasioned certain death. And yet you cannot conceive one particle of the water, without a particle of the medicine. 'Tis not impossible, this may be one great use of air, by adhering so closely to the elementary fire, to temper and render salutary to the body, what would otherwise be fatal to it.

7. To put it beyond dispute, that this fire is largely mixt with the air, you may make the following experiment. Take a round lump of iron, and heat it to a degree called a *welding* heat: Take it out of the fire, and with a pair of bellows blow cold air upon it. The iron will then as effectually melt, as if it were in the hottest fire. Now when taken out of the forge, it had not fire enough in it to conquer the cohesion of its parts: But when this fire is joined with that which was mixt with the air, it is sufficient to do it. On the same principle we account for the increase of a coal or wood fire by blowing it.

8. And let none wonder that fire should be so connected with air, as hardly to be separated. As subtle as fire is, we may even by art attach it to other bodies; yea, and keep it prisoner for many years: and that either in a solid or a fluid form. An instance of the first we have in steel: which is made such, only by impacting a large quantity of fire into bars of iron. In like manner we

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impact a great quantity of fire into stone, to make lime. An instance of the second kind we have in spirits, wherein fire is imprisoned in a fluid form. Hence common spirits will burn all away. And if you throw into the air spirits rectified to the highest degree, not one drop will come down again, but the universal fire will take hold of and absorb it all.

9. That this fire subsists both in air, earth and water; that it is diffused through all and every part of the universe, was *suspected* by many of the ancient naturalists, and *believed* by the great Sir *Isaac Newton*. But of late years it has been fully demonstrated: particularly, by Mr. *Stephen Gray*, a Pensioner at the *Charter-house*; who some years since presented to the Royal Society, an account of many experiments he had made, whereby this subtle fluid became clearly perceptible both to the sight and feeling. Because the glass tube, by means of which those experiments were made, was observed when rubbed to attract straws and other light bodies (a known property of amber, called in *Latin Electrum*) *these* experiments were termed *electrical*: a word which was soon affixed to that subtle fluid itself, and every thing pertaining to it. But improperly enough: seeing the attracting (or seeming to attract) straws and feathers, is one of the most inconsiderable of all the effects, wrought by this powerful and universal cause.

10. It was afterwards found, that a glass globe was on some accounts preferable to a glass tube: particularly, as it was less labour to turn the one for some hours together, by means of a small wheel, in the mean time rubbing it with a dry hand, or a little cushion, than to rub the tube for so long a time. It was likewise observed, that a greater quantity of ethereal fire might be *collected* by this means than by the other.

I say *collected* ; for that fire is no more *created* by rubbing, than water is by pumping. The grand reservoir thereof is the earth, from which it is diffused thro' all the other parts of common matter. Accordingly in these experiments, the globe rubbing against the cushion, collects fire from it. The cushion receives it from the frame of the machine ; the frame of the machine from the floor. But if you cut off the communication with the floor, no fire can be *produced*, because none can be *collected*.

11. In the year 1746, Mr. de *Muschenbroek*, professor of natural Philosophy at *Leyden*, was led by a casual experiment, into many new discoveries. These were chiefly made by means of a large but thin glass phial. The best way to prepare which is, to coat it with thin lead ; to line it on the inside with leaf-gold, to within two inches of the top, and to fasten some tinsel fringe to the bottom, (or to the end of the wire within the phial) so as to touch the gold lining. By this wire going thro' the cork, the phial is hung on any metallic body, which communicates by a wire, with the globe or tube. This metallic body has been term'd, *the prime conductor*, as it conducts or conveys the fire collected by the tube or globe, either into the phial, or into any other body communicating therewith.

12. But all bodies are not capable of receiving it. There is in this respect an amazing difference between them. The excrements of nature, as wax, silk, hair, will not receive the ethereal fire, neither convey it to other bodies : so that whenever in circulating it comes to any of these, it is at a full stop. Air itself is a body of this kind ; with great difficulty either receiving or conveying this fire to other bodies : so are pitch and rosin (excrements, as it were, of trees.) To
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these we may add glass, amber, brimstone, dry earth, and a few other bodies. These have been frequently stiled *Electrics per se*; as if they alone contained the *electric fire*: an eminently improper title, founded on a palpable mistake. From the same mistake, all other bodies, which easily receive and readily convey it, were termed *non-electrics*; on a supposition, that they contained no *electric fire*: the contrary of which is now allowed by all.

13. That this fire is inconceivably subtle, appears from its permeating even the densest metals, and that with such ease, as to receive no perceptible resistance. If any one doubt, whether it pass thro' the substance, or only along the surface of bodies, a strong shock taken thro' his own body, will prevent his doubting any longer. It differs from all other matter in this, that the particles of it repel, not attract, each other. And hence is the manifest divergency in a stream of electrical effluvia. But tho' the particles of it repel each other, yet are they attracted by all other matter. And from these three, the extreme subtlety of this fire, the mutual repulsion of its parts, and the strong attraction of them by other matter, arises this effect, that if a quantity of electric fire be applied to a mass of common matter of any bigness or length, (which has not already got its quantity) it is immediately diffused thro' the whole.

14. It seems, this globe of earth and water, with its plants, animals, buildings, have diffused thro' their whole substance, just as much of this fire as they will contain. And this we may term their *natural quantity*. This is not the same in all kinds of matter: neither in the same kind of matter in all circumstances. A solid foot of one kind of matter (as glass) contains more of it than

a solid foot of another kind. And a pound weight of the same kind of matter, when rarefied, contains more than it did before.

15. We know that this fire is *in* common matter, because we can pump it *out*, by the globe or tube: we know that common matter has near as much of it as it can contain, because if we add a little more to any portion of it, the additional quantity does not enter, but forms a kind of atmosphere round it. On the other hand we know that common matter has not more of it than it can contain. Otherwise all loose portions of it would repel each other; as they constantly do, when they have such atmospheres. Had the earth, for instance, as much electric fire in proportion, as we can give to a globe of iron or wood, the particles of dust and other light matter, would not only repel each other, but be continually repelled from the earth. Hence the air being constantly loaded therewith, would be unfit for respiration. Here we see another occasion to adore that wisdom, which has made all things by weight and measure.

16. The form of every electric atmosphere, is that of the body which it surrounds: because it is attracted by every part of the surface, tho' it cannot enter the substance already replete. Without this attraction, it would not remain round the body, but dissipate into the air.

17. The atmosphere of an electrified sphere, is not more easily drawn off, from any one part of it than from the other, because it is equally attracted by every part. But it is not so with bodies of other figures. From a cube it is more easily drawn off at the corners than at the sides: and so from the corners of bodies of any other form, and most easily from the sharpest corners. For the force with which an electrified body re-

tains its atmosphere, is proportioned to the surface on which that atmosphere rests. So a surface four inches square retains its atmosphere, with sixteen times the force that one of an inch square does. And as in pulling the hairs from an horse's tail, a force insufficient to pull off an handful at once, could easily pull it off hair by hair: so tho' a blunt body can't draw off all the atmosphere at once, a pointed one can easily draw it off, particle by particle.

18. If you would have a sensible proof, how wonderfully pointed bodies draw off the electric fire, place an iron shot of four inches diameter on the mouth of a dry bottle. Suspend over it a small cork-ball by a silken thread, just so as to rest against the side of the shot. Electrify the shot, and the ball will be repelled four or five inches from it. Then present to the shot six or eight inches off, the point of a sharp bodkin. The fire is instantly drawn off; so the repulsion ceases, and the ball flies to the shot. But a blunt body will not produce this effect, till it is brought within an inch of the shot. If you present the point of the bodkin in the dark, you may see sometimes at a foot distance, a light gather upon it like a glow-worm, which is manifestly the fire it extracts from the shot. The less sharp the point is, the nearer it must be brought before you can see the light. And at whatever distance you see the light, you may draw off the electric fire.

19. To be convinced that pointed bodies *throw* off, as well as *draw* off the fire, you may lay a long sharp needle on the shot. It cannot then be electrified, so as to repel the ball, because the fire thrown upon it, continually runs off at the point of the needle: from which in the dark you may see such a stream of light, as in the preceeding instance.

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20. While the electric fire, which is in all bodies, is left to itself, undisturbed by any external violence, it is more or less dense, according to the nature of the body which it is in. In dense bodies it is more rare: in rare bodies it is more dense. Accordingly every body contains such a quantity of it, rare or dense, as is suitable to its nature. And there is some resistance to every endeavour of altering its density, in the whole of any body, or in any part of it. For all bodies resist either the increase or diminution of their natural quantity. And on the other hand, when it has been either increased or diminished, there is a resistance to it's return to it's natural state.

21. With regard to the different resistance made by different bodies, in either of these cases, it is an invariable rule, that glass, wax, rosin, brimstone, silk, hair, and such like bodies, resist the most: and next to these, the air, provided it be dry, and in a sufficient quantity. That this resistance is least in metals, minerals, water, quicksilver, animals and vegetables: which we may rank together, because the difference in their resistance is very inconsiderable: and that in these bodies the resistance is greater, when their surfaces are polished, and extended in length, than when their surfaces are rough and short, or end in sharp points.

22. When a body has more electric fire forced into it, than it has naturally, it is said to be electrified *positively*. When part of the natural quantity is taken away, it is said to be electrified *negatively*. Now when an iron bar is *negatively* electrified, the fire drawn out, does not go in again as soon as the experiment is over, but forms an atmosphere round it, because of the resistance it finds in its endeavour to dilate itself, either into the air or into the bar. And when it is electrified *positively*,

the same kind of atmosphere is form'd, by the fire accumulated upon it. Whether therefore bodies are electrified negatively or positively, and remain so when the experiment is over, there are similar atmospheres, surrounding them, which will produce similar effects.

23. But we can electrify no body beyond a certain degree: because when any is electrified to that point, it has an atmosphere round it sufficiently strong to ballance any power that endeavours to electrify it farther. Nor is the electric fire either from the tube or the globe, able to force its way thro' this.

24. And in the ordinary course of nature, this subtle, active fluid, which not only surrounds every gross body, but every component particle of each, where it is not in absolute contact with its neighbouring particle, can never be idle, but is ever in action, tho' that action be imperceptible to our senses. It is ever varying its condition, tho' imperceptibly, in all parts of all bodies whatever; and electrifying them more or less, tho' not so forcibly as to give sensible signs of it. All bodies then, and all their component particles, when in their natural situation, have round their surfaces, where they are not in absolute contact with other surfaces, an imperceptible atmosphere sufficient to ballance the smaller force with which they are attacked, every way similar to the perceptible atmosphere of bodies forcibly electrified. In these imperceptible atmospheres is placed the power which resists their being electrified to an higher degree than they are naturally. And this power lies in the elasticity of the subtle fluid, every where dispersed both round all bodies and in them.

25. Glass is very difficultly electrified, which seems to prove it has a very dense electric atmosphere.

Metals

Metals are easily electrified. Consequently they have rare and therefore weakly-resisting atmospheres. But as heat rarefies all bodies, so if glass be heated to a certain degree, even below melting, it will give as free a passage to the electric fire, as brass or iron does: the atmosphere round it being then rendered as rare as that of metals. Nay, when melted, it makes no more resistance than water. But its resistance increases, as it cools. And when it is quite cold, it resists as forcibly as ever. Smoothly-polish'd wax resists as much as glass. But even the small heat raised by rubbing, will render its atmosphere as rare as that of metals, and so intirely destroys its resistance. The same is true of rosin and brimstone. Even the heat arising from friction, destroys the resistance which they naturally make to being electrified: a strong proof, that the resistance of all bodies there-fore, is exerted at their surfaces, and caused by an electric atmosphere of different densities, according to different circumstances.

26. Most experiments well succeed as well with a globe of brimstone, as with one of glass. Yet there is a considerable difference in their nature. What glass repels, brimstone (as also rosin) attracts. Rubbed glass emits the electric fire: rubbed brimstone, rosin and wax receive it. Hence if a glass globe be turned at one end of a prime conductor, and a brimstone one at the other, not a spark of fire can be obtained; one receiving it in, as fast as it is given out by the other. Hence also if a phial be suspended on the prime conductor, with a chain from its coating to the table, and only one globe turned, it will be electrified, (or *charged*, as they term it) by twenty turns of the wheel: after which it may be *discharged*, that is, unelectrified, by twenty turns of the other wheel.

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27. The difference between *Non Electrics* (vulgarly speaking) and *Electrics per se*, is chiefly this.

1. A *Non Electric* easily suffers a change, in the quantity of fire it contains. Its whole quantity may be lessened by drawing out a part, which it will afterwards resume. But you can only lessen the quantity contain'd in one of the surfaces of an *Electric*: and not that, but by adding at the same time an equal quantity to the other surface. So that the whole glass will always have the same quantity in its two surfaces. And even this can only be done in glass that is thin: beyond a certain thickness we know no power that can make this change. 2. The ethereal fire freely moves from place to place, in and through the substance of a *Non Electric*. But through the substance of an *Electric* it will by no means pass. It freely enters an iron-rod, and moves from one end to another, where the overplus is discharged. But it will not enter, or move through a glass-rod. Neither will the thinnest glass which can be made, suffer any particle of it entering one of its surfaces, to pass through to the other.

28. Indeed it is only metals and liquids, that perfectly *conduct* (or transmit) this fire. Other bodies seem to conduct it, only so far as they contain a mixture of these; accordingly, moist air will conduct it, in proportion to its moistness. But dry air will not conduct it at all: on the contrary, it is the main instrument, in confining any electric atmosphere, to the body which it surrounds. Dry air prevents its dissipating (which it does presently when *in vacuo*) or passing from body to body. a clear bottle full of air, instead of water, cannot be electrified. But exhausted of air, it is electrified as effectually as if it was full of water. Yet an electrical atmosphere and air, do not exclude one another. For we breathe in it freely, and

and dry air will blow through it, without altering it at all.

29. When a glass phial is electrified, whatever quantity of fire is accumulated on the inner surface, an equal quantity is taken from the outer. Suppose, before the operation begins, the quantity of fire contained in each surface, is equal to twenty grains: suppose at every turn of the globe, one grain is thrown in: then after the first stroke there are twenty one within, nineteen only without: after the second, the inner surface will have twenty-two, the outer but eighteen: and so on, till after twenty strokes, the inner will have forty, the outer none. And the operation ends: for no power or art of man can throw any more on the inner surface, when no more can be taken from the outer. If you attempt to throw more in, it is thrown back through the wire, or flies out, in cracks through the sides of the phial. The equilibrium cannot be restored in this phial, but by a communication formed between the inner and outer surface, by something external, touching both the outer, and the wire which communicates with the inner surface. If you touch these by turns, it is restored by degrees: if both at once, it is restored instantly. But then there is a shock occasioned by the sudden passing of the fire through the body, in its way from the inner to the outer surface. For it moves from the wire to the finger, (not from the finger to the wire, as is commonly supposed.) Thence it passes through the body to the other hand, and so to the outer surface.

30. The force with which this shock may be given, is far greater than one would conceive. It will kill rats, hens, or even turkeys in a moment: others, that are not quite killed, it strikes blind. It will give polarity to a fine needle, making

ing it point north and south, as if touched by a loadstone. It will invert the polarity of a compass, and make the north point turn to the south. At the same time the ends of the needles are finely blued like the spring of a watch. It will melt off the heads and points of pins and needles: and sometimes the whole surface of the needle is run and appears as it were blistered, when examined by a magnifying glass. It will melt thin gold or silver, when held tight between two panes of glass, together with the surface of the glass itself, and incorporate them in a fine enamel. Yea a strong spark from an electrified phial, makes a fair hole through a quire of paper doubled: which is thought good armour against the push of a sword, or even a pistol bullet. And 'tis amazing to observe in how small a portion of glass, a great electrical force may be. A thin glass bubble, about an inch diameter, being half filled with water, partly gilt on the outside, when electrified, gives as strong a shock as a man can well bear: allowing then that it contains no more fire after charging than before, how much fire must there be in this small glass! It seems to be a part of its very substance. Perhaps if that fire could be separated from it, it would be no longer glass. It might in losing this, lose its most essential properties, its transparency, brittleness, and elasticity.

31. Some have not improperly supposed, that all *Electric* bodies, so called, are by their original constitution, thoroughly saturated with electric fire: that it remains fixt in them, (unless while the texture of those bodies is quite alter'd by liquefaction) that fire fixt in a body constitutes an *Electric*, and all bodies where it is not fixt are *Non Electrics*. Agreeably to which they suppose, that in all *Non Electrics*, the original fire, loosely inhering, is easily driven on by the new collected fire, which

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then possesses its place : but that in *Electrics*, the original fire being impacted into their substance, and therefore more firmly inhering, will not give way to, or be driven on by the new collected fire. Such is air in particular ; with the particles of which the original fire is closely incorporated. Dry air seems to be so fully saturated with it, that it is scarce capable of receiving any more : whereas all new-collected fire is continually endeavouring to return into the earth. Let wires be electrified ever so strongly, yet the moment any part of them is touched by a person standing on the floor, they are electrified no longer ; all the fire escaping through him into the earth.

32. Upon the principles of electricity, we may give a more rational account, of many appearances in nature, than has yet been done : of thunder and lightning in particular. In order to which we may observe, all electrified bodies retain the fire thrown into them, till some non-electric approaches : to which it is then communicated with a snap, and becomes equally divided. Electric fire is strongly attracted by water, and readily mixes with it. And water being electrified, the vapours arising from it, are equally electrified. As these float in the air, they retain the additional fire, till they meet with clouds not so much electrified. Then they communicate it with a shock.

33. The ocean is compounded of water, and salt ; one an electric, the other not. When there is a friction among the parts near its surface, the fire is collected from the parts below. It is then mainly visible in the night, at the stern of every sailing vessel. It appears from every dash of an oar ; in storms the whole sea seems on fire. The particles of water then repelled from the electrified surface, continually carry off the fire as it is collected. They rise and form clouds which are highly

ly electrified, and retain the fire till they have an opportunity of discharging it.

34. Particles of water rising in vapours, attach themselves to particles of air. One particle of air may be surrounded by twelve particles of water as large as itself, all touching it, and by more added to them. Particles of air thus loaded would be drawn nearer together by the mutual attraction of the particles of water, did not the fire, common or electric, included therein, assist their mutual repulsion. Hence they continue suspended. But if air thus loaded, be compressed by adverse winds, or by being driven against mountains, or if it be condensed by the loss of its fire, it will continue suspended no longer, but will descend in dew. And if the water surrounding one particle of air comes into contact with that surrounding another, they naturally coalesce into a drop, and so descend in rain.

35. The sun supplies common fire to all vapours, rising either from sea or land, vapours, having both this and electric fire, are better supported than those which have this only. For when vapours rise into the coldest region, the common fire may fall. But the cold will not diminish the electric: this is always the same. Hence clouds raised from fresh waters, from moist earth, or growing vegetables, more easily descend and deposite their waters, as having but little electric fire, to keep the particles separate from each other. So that the greatest part of the water raised from the land, falls on the land again. But clouds raised from the sea, having both fires, and much of the electric, support their water far more strongly, and being assisted by winds, may bring it from the middle of the widest ocean to the middle of the broadest continent. And yet a way is provided whereby these also are readily brought to deposite

posite their water. For whenever they are driven against mountains by the winds, those mountains take away their electric fire: and being cold, the common also: hence the particles immediately close. If the air was not much loaded, the water falls in dew on the top and the sides of the mountain. If it was, the electric fire being taken at once from the whole cloud, it flashes brightly, and cracks loudly. And the particles instantly coalescing for want of that fire, fall in an heavy shower.

36. When a ridge of mountains stops the clouds, and draws the electric fire from the cloud first approaching it, the next when it comes near the first, now deprived of its fire, flashes into it, and deposite its own water. The third cloud approaching, and all that succeed, act in the same manner; as far back as they extend, which may be for several hundred miles. Hence the continual storms of thunder; lightning and rain, on the east side of those vast mountains, the *Andes*, which running north and south, intercept all the clouds brought against them from the *Atlantick* ocean. In a plain country, there are other means to make them drop their water. For if an electrified cloud coming from the sea, meets in the air a cloud coming from the land, and therefore not electrified, the first will give its flash into the latter, and thereby both will be made to deposite their water. The concussion of the air contributes also to shake down the water, not only from those two clouds, but from others near them. When the sea and land clouds would pass at too great a distance from each other, they are mutually attracted till within the distance. For the sphere of electrical attraction is far beyond the flashing distance. And yet where a cloud contains much fire, it may strike at a considerable distance. When a con-

C

ductor

ductor has but little fire in it, you must approach very near before you can draw a spark. Throw into it a greater quantity of fire, and it will give a spark at a greater distance. But if a gun barrel, when electrified, will strike and make a noise, at the distance of an inch, at what a distance, and with how great a noise, may ten thousand acres of electrified cloud strike? No wonder that this should melt metals (which our artificial flash does in some degree) tho' perhaps not so properly by its heat, as by insinuating into the pores, and creating a violent repulsion between the particles of the metal it passes thro'. This overcomes the attraction whereby they cohere, and so melts the metallic body. And this accounts for its melting a sword in the scabbard, or gold in the pocket, without burning either.

37. But thunder-clouds do not always contain more than their natural quantity of electric fire. Very frequently they contain less. And when this is the case, when they are negatively electrified, altho' the effects and appearances are nearly the same, yet the manner of operation is different. For in this case, it is really the fire from the mountains, or other parts of the earth which strikes into the cloud; and not, as we imagine, fire from the cloud which strikes into the earth. And we may easily conceive, how a cloud may be negatively electrified. When a portion of water is rarefied into a thin vapour, the fire it contains is rarefied too. Consequently it has then less than its natural quantity of fire. Such a cloud therefore coming within a due distance of the earth, will receive from it a flash of electric fire; which flash, to supply a great extent of cloud, must often contain a great quantity of fire. Such a cloud also passing over woods of tall trees, may silently receive some supply, either from the points of the
boughs,

boughs, or from the sharp ends and edges of the leaves. The cloud thus supplied, flashes into other clouds that have not been so supplied; and those into others, till an equilibrium is produced, among all that are within a striking distance of each other. And hence are repeated strokes and flashes, till they descend in showers to the earth, their original. Rain, especially when in large drops, generally brings down the electric fire: falling snow often: summer hail, always, tho' silently. Consequently, any of these may prevent thunder and lightning; or at least, abate its violence. Rain is helpful in another respect likewise. By wetting men or beasts, it saves many lives. For if your cloathes are throughly wet, and a flash of lightning strikes the top of your head, it will run in the water over the surface of your body into the ground: whereas if your cloaths were not wet, it would go thro' your body. Hence a wet chicken cannot be killed by a stroke from the phial: whereas a dry one is killed in an instant. See here also the wisdom and goodness of him, *who sendeth forth lightnings with the rain!* It should likewise be observed, that wherever electrified clouds pass, spires, towers, chimneys, and high trees, as so many points, draw the electric fire, and the whole cloud frequently discharges there. Therefore it is highly dangerous in such a storm, to take shelter under a tree.

38. Common fire (if it be any thing more, than a different modification of the same element) is more or less in all bodies, as well as electrical. If there be a sufficient quantity of either in any body, it is inflamed. But when the quantity of common fire therein is small, there needs more electric fire to inflame it. Where the quantity of common fire is greater, less of the electric will suffice. So if spirits are heated, a small spark in-

flames them. If they are not, the spark must be greater. Sulphureous vapours, whether rising from the earth, or from stacks of moist hay or corn, or any other heated and reeking vegetable, contain abundance of common fire. A small addition of electric then will inflame them. Therefore they are easily kindled by lightning.

39. Any who would be clearly convinced of the nature of lightning, may make the following experiment. Make a small cross of two thin strips of wood, the arms being just so long, as to reach the four corners of a large, thin silk handkerchief when extended. Tie the corners of this to the extremities of the cross: and so you have the body of a kite: Add to this a proper tail, loop and string, and it will rise in the air like one made with paper: but this is fitter to bear the wind and wet in a storm without tearing. To the top of the cross fix a sharp pointed wire, rising a foot above it. Tie a silk ribbon to the end of the twine next the hand: and where the silk and twine join, fasten a key. Raise this kite when a thunder-storm is coming on: but he that holds the string, must stand in a porch, or under some other covering, that the ribbon may not be wet. He must likewise take particular care, that the twine do not touch the top or side of the porch. As soon as the thunder cloud comes over the kite, the pointed wire draws the electric fire from it. The kite and all the twine are then electrified, as plainly appears by this, that the loose filaments of the twine stand out every way, and are attracted by an approaching finger. And when the kite and twine being wet, conduct the fire freely, it will stream from the key, on the approach of the knuckle. By this key the phial may be charged, and all other experiments made, as by the globe. And this is a demonstration,
that

that the electric fire thereby obtain'd, is the very same with that of lightning.

40. May not the knowledge of this power in pointed bodies, of drawing off the fire contain'd in these clouds, suggest to us a very probable method, of preserving houses, churches, ships from the stroke of lightning? Might we not fix on the highest part of them, upright rods of iron made sharp as needles, and gilt, to prevent rusting, which otherwise would hinder their free conveyance of the electric fire? From the foot of those rods (which need not be above half an inch diameter) a wire may pass down the outside of the building into the ground; or down round one of the shrouds of a ship, and down her side, till it reaches the water. Would not these rods silently draw off the electric fire, before the cloud was nigh enough to strike? And thereby in a good measure secure us from that most sudden and terrible mischief! Let it not be objected, that the using this probable means of preventing a threatening danger, would imply any denial of, or distrust in, Divine Providence. Not at all: we know the Creator of the universe, is likewise the governor of all things therein. But we know likewise, that he governs by second causes; and that accordingly it is his will, we should use all the probable means he has given us, to attain every lawful end. It is therefore no more an impeachment of his providence, when we foresee a storm of lightning and rain, to shelter our house (as far as we are able) from the one, than to shelter ourselves in that house from the other. Is it not just as innocent (if it be possible) to keep our rooms tight from lightning, as from wind and water?

41. It may not be improper to add one or two observations, before we proceed to what is of more importance. Scarce any phenomenon in nature

has been esteem'd more difficult to be accounted for than those luminous appearances in the sky, term'd *Aurora Borealis*, or *Northern Lights*. But these also may be rationally explain'd, upon the principles of electricity. We often see clouds at different heights, passing different ways, north and south at the same time. This manifestly proves different currents of air, one of them under the other. Now as the air between the tropics is rarefied by the sun, it rises; the denser air pressing into its place. The air so raised, moves north and south, and if it has no opportunity before, must descend in the polar regions. When this air with its vapours descends into contact with the vapours arising there, the electric fire which it brought begins to be communicated, and is seen in clear nights; being first visible where it is first in motion, namely in the most northern parts. But from thence the streams of light seem to shoot southerly, even to the zenith of northern countries.

42. Another phenomenon of a totally different kind, may be accounted for on the same principles, altho' Mr. *Prior* supposes *Solomon* himself to ask, as a question which he could not answer,

" Whence does it happen, that the plant which
well

We name the *sensitive*, should move and feel ?

Whence know her leaves to answer her command,
And with quick horror fly the neighbouring
hand ?"

Allowing for poetical amplification, the plain fact is this. The sensitive plant, as it were, shrinks away, as soon as your hand approaches it. And from a turgid and vivid appearance, instantly droops and hangs its leaves. Now suppose this plant to contain more electric fire than any other plant or
animal,

animal, it must of course communicate that fire to any other that touches it. And if so, its leaves and branches must be in a languid state, till they have recovered their natural quantity. To illustrate this, set any small tree in a pot on a cake of brimstone. Electrify it and it grows extremely turgid, so as to erect its leaves. But the moment you touch one of them, the whole tree droops, and hangs all its leaves and branches.

To throw all the light I can on the subject, I subjoin a few extracts from several other writers.

An Extract from Mr. Watson's Experiments and Observations.

1. When two plates, the one electrified, the other not, were brought near each other, the flashes of *bright flame* were so large, that in a dark room, I could distinctly see the faces of 13 persons. P. 6.

2. A piece of large blunt wire was hung to the conductor. To the end of this when electrified, a black surface not electrified being brought near, (though not near enough to cause a snap) a brush of *blue flame*, quite different from the former, issued of more than an inch long, and an inch thick. P. 7.

3. If a person strongly electrified lays his hand on the cloaths of one that is not, especially if they are thin woollen or silk, they both feel as it were *many pins pricking* them, as long as the globe is in motion.

4. If oil of turpentine be set on fire in a vessel held by one electrified, *the smoke* arising therefrom, received against a plate held at a foot distance from the flame, by one standing on rosin, will enable him to fire warm spirits of wine. The electric strokes have been likewise felt upon touching the second man, when the plate he held

in the smoke has been between seven and eight feet above the flame. P. 8.

5. Take burning spirits of wine instead of oil of turpentine: and if the second man hold the end of an iron rod at the top of the *flame*, he may kindle other warm spirits held near his finger. Hence we find that either smoke or flame conducts the electric fire, and does not preceptibly diminish its force. P. 9.

6. If the wire of the phial be not touched, the electrified water or steel dust will retain its force many hours, may be conveyed several miles, and will afterward exert its force upon touching the wire. P. 16.

7. If an egg is hung on the conductor, and a person grasping the electrified phial with one hand, brings the palm of his other near the bottom of the egg, he receives a smart stroke on the hand, as with a ferula, and his hand seems full of a more red fire than is usually observed. P. 24.

8. Any number of persons communicating with each other, the first of whom grasps the phial, and the last touches the conductor, receives the same shock as if it was one only. P. 25.

9. The electric force always describes a circuit, and moves in the straightest line it can, between the conductor and phial. P. 26.

10. To prove this, while the machine stood on wax, I stood upon the floor; and putting one hand on the machine, touched the gun barrel with the other. Upon this fire issued, and the snapping continued as long as I held my hand on the machine, but no longer. This shew'd at once, that the electric fire passed from the floor through my body to the machine. P. 36.

11. If the electric fire is not stopt, no sign of its presence is observable in the bodies suspended to the globe. Tho' it throws ever so much of this
fire

fire upon them, it passes from them to the floor whence it came. But if it is stoppt, it is then accumulated in or upon these bodies; although this can be done only to a certain degree, after which it continually disperses. If when it is accumulated, a man standing on the floor touches those bodies, the snap is felt, and the fire is seen. But this snapping is not, when the fire passes off continually, as from a piece of blunt wire hung to the barrel, and a hand brought near it. Then it appears like a blue cone of flame, with its point towards the wire. When the hand is held at a proper distance, there is a blast therefrom, as of cold air. If you do not determine the electric fire to a point, it is dispersed from all parts of the electrified body: but if you do, by thus holding your hand near the fire, you see how it passes to the floor, and so into the earth. The globe therefore only circulates this fire, which is collected by its friction against the hand or cushion, and which is constantly supplied to these from the earth. And accordingly the ingress of it, as well as the egress is visible. For, if while any unelectrified body touches the barrel, you bring your finger near the wood-work of the machine, you will see the brush of blue flame set in from it to the wood-work. And this flame passes diverging into the machine, and continues as long as the barrel is touched. P. 44.

12. That the electric atmosphere which surrounds all electrified bodies, extends to a considerable distance, appears from their attracting a fine thread, at the distance of some feet. If no unelectrified body is near, this atmosphere seems to be equally spread over that which is electrified. But if one unelectrified is brought near, the greatest part of it is determined that way; whence the attraction of the other parts of the electrified body

is considerably diminished. This is the cause of electric repulsion, which does not operate, till the electric ether is sufficiently accumulated. This repulsion is strongest in those parts of the electrified body, where unelectrified bodies are brought near it. For by these the electric blast, which otherwise is general, is particularly determined. P. 46.

13. When the machine is placed upon rosin, if a man standing likewise on rosin, touches the barrel while the globe is turning, he will receive a snap or two, and no more. But if he touch the wood-work of the machine with one hand, and the barrel with the other, he receives snaps again, which continue as long as he touches the machine, and no longer. Here the man by touching the machine with one hand, becomes a part thereof; and by turning the globe, part of the electric fire inherent in his body, is transmitted to the barrel; but it is restored to him, on his touching the barrel with his other hand. If instead of touching the machine or barrel, he holds his finger near either, or both, you see the fire go out and return. P. 64.

14. May we not gather from the preceeding experiments, 1. That the attraction and repulsion of electrified bodies, is owing to the flux of electric ether? 2. That this ether is no other than pure fire? 3. That this fire appears in different forms, according to its different modifications? When brought towards a point is it not a lambent flame? When nearer still, may we not both hear and feel it? And does not its lighting up spirits demonstrate, that it is real fire? 4. That this fire is intimately connected with all bodies, tho' least of all with pure, dry air? We have extracted it from water, flame, smoke, red hot iron; and from a mixture 30 degrees colder than the

the freezing point. 5. That it is extremely subtle and highly elastic? 6. That the electric machine may as properly be termed a *Fire-pump*, as Mr. Boyle's machine, an *Air-pump*? And lastly, that fire is not mechanically producible from other bodies, but is an original, distinct principle?

An Extract from Mr. Wilfon's Dissertation on Electricity.

Prop. 1. When two bodies equally replete with electric matter approach each other, no flame or snap will ensue. P. 5.

Prop. 2. Two bodies equally electrified repel each other. P. 6.

Prop. 3. An electric body interposed between a person and the earth, prevents his exciting electricity in another body by friction. P. 11.

Prop. 4. If there is originally a certain quantity of electric matter in a body of a given magnitude and density; and that matter be equally distributed therein, by its elastic force, according to the density of the parts: upon increasing the quantity of matter by adding other bodies of the same kind, the quantity of electric matter will be increased in the same proportion. P. 14.

Prop. 5. As electric bodies act on light bodies that are not electrified, so unelectrified bodies act on the electric matter contained in electrified bodies. P. 16.

Let a wire be electrified in the dark, and if you hold any unelectrified body 7 or 8 inches from the end of it, a stream of fire will issue from it, which will diverge to that body. But the divergency will lessen as it approaches it, till the rays become parallel. If the body be held not directly before the end of the wire, but wide of it at about two inches distance, the fire will describe curvilinear rays towards that body. P. 17.

Hence

Hence it appears, that unelectrified bodies act in like manner with electrified : Only the acting force of the one, being increased by friction, is greater than that of the other.

Prop. 6. When two equally electric atmospheres are brought so near as to touch, they repel each other with a force equal to their densities.
P. 19.

Prop. 7. If while a fluid surrounds a globe which is electrified and turned round an axis passing thro' its center, an unelectrified body be held near the equator of it, the fluid will rise successively towards that body, as it turns round, in like manner as the sea is affected by the moon.
P. 23.

The shock given by the phial is in proportion to the size of it, the thinness of the glass, and the number of points in contact with its surface.
P. 25.

An Extract from Mr. Martin's Essay on Electricity.

1. The *Electric Matter* is emitted from some sort of bodies when rubbed, which are called *Electrics*. P. 9.

2. By other sort of bodies, therefore termed *Non-Electrics*, it is not emitted.

3. It will run off to all *Non-Electrics*, but is restrained by all *Electrics*.

4. It shines like a *flame*, and is emitted with a *snap* : If towards a *Non-Electric*, the fire is condensed, less or more, and so appears of a bluish, purple, yellow, or white colour.

When the electric fire is not so much condensed as to explode, as in thunder and lightning, it goes off in a dilated stream of purple flame, greatly resembling that part of the *Aurora Borealis*, which appears in streams of light.

When

When it is little condensed, it appears *bluish*, as all other faint lights do: when a little denser, it appears *purple*: when denser still, it looks *yellow*, like candle light: when highly condensed, it is clear and *white*, like the light of the sun. So the white lightning is of all others most fierce. So Phosphorus rubb'd a little, spends itself in an harmless blue flame: but upon a greater attrition, kindles into a white flame, and burns with an outrageous and unquenchable fire. p. 17.

And as lightning pervades soft substances unhurt, but dissolves hard and compact bodies, so electric fire pervades the soft, muscular parts of the body, but violently strikes the bones and tendons. Again, as those denser parts of lightning which we call thunder-bolts, striking against hard bodies, glance by reflection to different parts, so this fire striking against the elbow, is reflected from thence across the breast, to the other elbow. p. 18.

Indeed different persons are affected thereby in a very different manner. Some are extremely capable of it, some not: and some are not susceptible of it at all: a person, for instance, who has the small-pox, cannot be electrified by any means whatever. p. 20.

Experiment 1. On the axis, in the center of my globe, is fixt a circular string of threads. When the globe is at rest, they all hang down: when it is in motion, they all extend themselves from the center, strait toward the inner surface of the globe (like the spokes of a coach-wheel) which they nearly touch. Thus they continue till the electric virtue ceases, and then gradually fall down, as at first. p. 22.

Exp. 2. While they are extended, if you move your hand toward the surface of the globe, they move every way toward the hand. Hence we see

the amazing subtlety of this fire, which pervades glass as readily as if nothing were in the way.

Exp. 3. Place a hoop of fine threads round the globe in motion, and all of them will stand perpendicular to the surface. Hence we learn that the electric power acts equally, both within and without the globe, and in directions perpendicular to its surface.

Exp. 4. If the room be then darken'd, the ends of the threads on the outside, will be all tip't with fire. But those within are not, which shews that this power acts only *ab intra* outwardly. p. 23.

Exp. 5. An iron rod being hung on silken strings, with one end about $\frac{1}{4}$ of an inch from the globe, will at the other end (which terminates in a conical point) emit a purple flame (diverging every way. Hold your finger within $\frac{1}{4}$ of an inch, and the fire will issue more largely. p. 24.

Exp. 6. Hold your finger still nearer, and the rays will be so condensed as to run to it in a stream of yellow flame; which is also sensible to the feeling, as a gentle wind, and smells like the fire of phosphorus.

Exp. 7. If you put your finger on the rod, the flame instantly disappears, the fire all running off upon the finger. But take it off, and the flame appears again.

Exp. 8. Apply your finger near a tin tube so suspended, and you may see the fire, and both hear and feel the snap. p. 25.

Exp. 14. Under an electrified plate, put some leaf-gold or other light substances on another plate unelectrified: and it will be attracted and repell'd alternately, between the two plates. For, each time it touches the lower plate, it discharges the electric fire, and so becomes again attractable. p. 28.

Exp.

Exp. 18. If to a gun barrel you adapt a small tin cup, and pour in water; a person holding his finger perpendicular over the water, within $\frac{1}{4}$ of an inch of its surface, will find the water rise in form of a cone to meet his finger, and from the top of it, a stream of fire will issue to the finger and snap as usual. p. 30.

Exp. 19. A dry sponge is an *electric*. But if it be dipt in water, and then hung on the barrel, put your finger near it, and the fire issues out, and the drops which before fell very slowly, will now fall very fast. If the room be darkened, they will appear as drops of fire. p. 31.

Exp. 20. A syphon hung on the cup, drops very gently till it is electrified; but then the water runs in a stream, which in the dark is like a stream of fire.

Exp. 21. Open a vein in a person standing on the Rosin, and the Blood will fly out to a certain distance. But let him be electrified, and it will spin out with a much greater force, and to a far greater distance.

Exp. 24. If mercury be put for water, the electric force is something greater, but in no proportion to its density.

Exp. 25. When the mercury is saturated, the electric streams will issue thro' the wire more copiously than from the phial of water, and will snap of themselves, which the streams issuing from the water ever do.

Exp. 27. The electrified phial will not retain the fire very long: but if you hold it up in a dark room, it will be seen to go off from the point of the wire, in a small white flame. p. 34.

Exp. 30. A cup of water held by an electrified person will emit fire more forcibly than his body. p. 35.

Exp. 32. A person standing on the ground, cannot easily kiss an electrified person standing on the rosin. p. 36. *or glasslegged stool*

Exp. 38. If a square piece of leaf gold be placed between two plates, about two inches asunder, one of them electrified, the other not, at first it will be attracted, and repell'd alternately, till in a while it will lose its motion, and remain suspended between them. p. 39.

Exp. 42. If the globe be exhausted of air, and then turn'd, the electric fire will act wholly within the globe, where it will appear (in a dark room) as a reddish or purple flame, filling the whole globe. But this, as the air is re-admitted into it, will gradually disappear. In this case, the electric fire is confined within, by the elastic air on the outside. p. 40.

An extract from Mr Watkins's account of electrical experiments.

When the machine is to be used, the globe should be wiped clean, with a clean, dry, warm flannel, its pivots oiled, and the ~~the~~ phial warmed. In damp weather, there should be a fire in the room. p. 4.

Exp. 4. Let an unelectrify'd plate, with scouring sand upon it, be held 5 or 6 inches under an electrify'd plate, and the sand will be so attracted and repell'd, as to resemble a stormy shower. p. 16.

Exp. 7. If a glass ball, of 4 or 5 inches diameter, be hung by a wire to the gun-barrel, and a ball of $\frac{3}{4}$ of an inch diameter, exceeding thin, placed on a smooth plate, be brought near it, this will not only be attracted by the large ball, but will perform continual revolutions round it, exactly as the planets do round the sun. p. 22.

Exp. 9. Hang a loadstone on the barrel, and a key on the armature of it: And if you bring your

your finger near the key, it will snap and emit fire. A plain proof that the electric and magnetic power no way hinder each other. p. 25.

Exp. 35. A sparrow killed by the electric shock, was found livid without, as if killed with a flash of lightning, and most of the blood vessels within were burst. Animals shock'd on the head, if not killed, are commonly struck blind. p. 55.

Exp. 41. Ice held by an electrify'd person, will fire warm spirits of wine. p. 61.

Exp. 43. Mr. *Watson* put an ounce of oil of vitriol, an ounce of iron filings and four ounces of water, into a flask. An ebullition ensued. An electrify'd person applied his finger to the mouth of the flask. The vapour took fire, and burnt out of the neck a long time. p. 63.

From an experiment made by Mr. *Watson*, and others, it appeared, that the electric fire circulated, without interruption, from the *Surry* side of the *Thames*, over *Westminster* Bridge, to the *Westminster* side, and thence thro' the river to the *Surry* side again, which is upwards of 800 yards. Spirits of wine also were fired at the same distance.

From this, and several other experiments, it appeared, that distance, simply considered, did little, if at all, impair the force of the electric shock.

They afterwards conveyed this shock thro' a circuit of four miles, and found the motion of the electric fire to be nearly, if not quite, instantaneous.

II. I have been hitherto endeavouring to make electricity plain: I shall endeavour, in the second place, to make it useful.

1. This ethereal fire, in its unmixed state, seems too violent an agent for the human body to bear. Therefore the wise author of nature has provided the air to temper and adapt it to our use. So tempered, it is the grand instrument of life: "it

gives and preserves," says bishop *Berkeley*, "a proper tone to the vessels. It promotes all secretions, keeping every part in motion: it pervades the whole animal system, producing great variety of effects, various vibrations in the solids, and ferments in the fluids." Indeed from many experiments we know, it communicates activity and motion to fluids in general, and particularly accelerates the motion of the blood in an human body. This is quickened three or four pulses in half a minute, by a person only standing on glass, and being electrified. And it is certain many bodily disorders may be removed, even by this safe and easy operation.

2. But because plain matters of fact weigh more than nice speculative reasoning with all who do not obstinately steel themselves against conviction, I shall, first, briefly specify several disorders wherein electrification has been found eminently useful, and then subjoin a few particular instances.

3. The disorders in which it has been of unquestionable use, are,

Agues,	Fistula Lacrymalis,
St. Anthony's fire,	Fits, Ganglions, Gout,
Blindness, even from a	Gravel,
Gutta Serena,	Head-Ach,
Blood extravasated,	Hysterics,
Bronchocele,	Inflammations,
Chlorosis,	King's Evil,
Coldness in the feet,	Knots in the flesh,
Consumption,	Lameness, Leprosy,
Contractions of the limbs,	Mortification,
Cramp,	Pain in the back, in the
Deafness, Dropsy,	Stomach,
Epilepsy,	Palpitation of the heart,
Feet violently disorder'd,	Palsy, Pleurisy,
Felons,	Rheumatism,
	Ring-

Ringworms,
Sciatica,
Shingles,
Sprain,
Surfeit,

Swellings of all kinds
Throat sore,
Toe hurt,
Tooth-ach,
Wen.

It will be easily observed, that a great part of these are of the nervous kind; and perhaps there is no nervous distemper whatever, which would not yield to a steady use of this remedy. It seems therefore to be the grand *Defideratum* in physic, from which we may expect relief when all other reliefs fail, even in many of the most painful and stubborn disorders to which the human frame is liable.

I have scarce known an instance wherein a few shocks all over the body, have failed to cure either a *Quotidian* or *Tertian Ague*.

Anne Heathcote, daughter of Mr. Heathcote, bra-
sier, in Long Alley, near Moorfields, was seized, in
May last, with what is commonly called an *ague*
in the head, having a violent pain in her head,
face, and teeth. After trying abundance of re-
medies, to no purpose, she was, in August, electri-
fied through the head. Immediately the pain fixed
in her teeth. She was electrified four times more,
and has felt nothing of it since.

4. "Having observed," says Mr. Lovet, "the
great efficacy of electrical ether, in soon relieving
most kinds of *inflammations*, I was inclined to
think the same efficacy would appear when it was
applied to *St. Anthony's Fire*. But when a case
offered, the inflammation was so great, that at first
I almost despair'd of success. About noon I made
the first trial, by drawing off sparks while the per-
son was electrified, on the rosin. Before night,
the angry swelling was much appeased, and in a
few days quite cured."

5. A boy about seven years old (says Mr. Floyer, a Surgeon in *Dorchester*) was taken blind suddenly in both his eyes, without any previous pain or fever. Three or four days after, he was brought to me. He was as blind, as if his eyes had been cut out. Taking the case to be a perfect *Gutta Serena* in both eyes, I told his parents, it was my opinion he would never see again. However I determined to try the electric shock: and the next morning, fastening a wire coming from the phial to his legs, and another round his head, I brought the latter near the conductor, and gave him four shocks successively. That day he was put to bed, and continued there, sweating profusely, till the next morning, when he agreeably alarmed his father by crying out, he could see the window. When he was brought to me the second time, he could see when I put my hand between his eyes and the light of the sun. This gave me encouragement to repeat what we had done the day before. The next day he could a little contract and dilate his eyes; the third day he could distinguish objects; the fourth, colours. The fifth day, after repeating the experiment, his sight was perfectly restored, and the eyes, in every respect, as well as if no disorder had happened to them.

6. From a gentleman in *Newcastle upon Tyne*, I have the following account. Last week a poor man in *Sandgate*, that had been blind twenty-four years, was lead to the machine. I set him upon the electrical board, and drew sparks for about twenty minutes from the pupil of his eye. After he had rested himself a little; and was able to look up, he told us he could see *Sidgate*, which he had not seen for many years before. He could also distinguish objects in the room, and was able to walk home without a guide. He came a second

cond time, and was so much better, that I imagine he did not think it necessary to come any more.

7. He adds, about the time I wrote last, a young woman was cured of a fourteen years blindness. She was able, before she went home, to distinguish one letter from another.

8. From the same person, a few days afterwards, I received the following lines.

"The cure of the blind man of *Newcastle*, has spread thro' all the country; in consequence of which, I am, much against my will, become an oculist.

"I have had several in hand, and among the rest a girl, about seventeen, has been with me about three weeks. Her case is owing to a film, or skin, grown over her eyes. It came by the small-pox about twelve years ago. Her friends have had all the advice, and used all the means in their power, but to no purpose; except that she has lost her left eye irrecoverably by one of the persons they applied to.

"When she came to me, the *Iris* of the right eye also was very near covered with a very thick skin, so that she could do very little more than distinguish day from night. It was grown much worse this winter, and was so blood-shot and angry, that I told her mother I could do nothing for her. However she made such a lamentable complaint, that I consented to try.

"The method I have taken, is drawing sparks from her eye, and sometimes giving shocks from her head or neck, down her arm, to carry off the frequent complaints of pain and dizziness in her head; which never fails of succeeding in about ten minutes. We have electrified her about half an hour twice every day. The skin wastes gradually, and grows thinner and less every day; so

so that now the colour of the eye appears through it, except in the middle, and towards the nose, where the film at first seemed twice as thick as the rest. The other day, as I had her under hand, she saw the buttons of my shirt sleeve, and of my coat; and yesterday saw the teeth of one of her companions that was laughing at her. But her eye is so weak, that I advised her to make very little use of it yet."

"A person having a dark, livid spot under his eye from a blow three days before, it was, in less than a quarter of an hour, quite taken away, by drawing the sparks from the parts." Mr. L.

Here *extravasated blood* was manifestly dissolved and reformed into the vessels. I have lately known an instance of this kind. One, whose eyes were almost beat out, as they term it, by the same operation, lost all the swelling, and the blackness too, in twelve minutes.

10. "A woman troubled with a *Bronchocele* the most obstinate of all swellings, whose neck was eighteen inches and one half about, is already so far relieved, that the largest part of her neck is but fifteen inches and an half about, the smallest not thirteen. And the swelling now wastes so fast, that there is hopes of a perfect cure." Mr. L.

"She applies the wire from the phial to one side of the swelling, and laying one end of another wire to the other side of it, then guides the other end of that wire to the electrical apparatus."

11. *William Jones*, a plaisterer, living at Mr. *Frazer's*, in *King-street*, *Seven Dials*, fell from a scaffold on *Thursday*, *Feb. 15* last. He was grievously *bruised*, both outwardly and inwardly, and lay in violent pain, utterly helpless, till *Saturday* in the afternoon, when he was brought (carried) by two
men

men to be electrified. After a few minutes he walked home alone, and on *Monday* went to work.

Mary Osgathorp had her foot *bruised* by a stone falling on it, which occasioned a running sore. It continued, tho' frequently healed for a time, upwards of eight years: but was entirely healed a month ago by electrifying, and has never broke out since.

12. A number of moderate shocks daily repeated for some time, effectually cure *coldness in the feet*. It does not fail.

13. *Angus McInnon*, of *Fuller's-rents* in *Holborn*, was afflicted with a violent cough, till his strength wasted away, and he had all the symptoms of a true *consumption*. He was electrified three times about eighteen months ago, and restored to perfect health.

Elizabeth Collis, a child of twelve years old, living with *Mrs. Wragg*, in *Windmill-street*, was so far gone in a genuine *consumption*, that she was judged to be quite past recovery. This summer she was electrified four times, and has been quite well ever since.

14. A man at *Upsal* in *Sweden*, whose knee-joint had been *contracted* above five years, (originally from an ill-cur'd rheumatism) was quite restor'd by drawing off sparks for a few weeks.

15. " *Mrs. M----- D-----*, of *Worcester*, was long afflicted with a most violent *cramp* in her legs. This disorder seized her before she was twenty years of age, and continued till she was upwards of seventy. This was most violent when she was in bed; at which time she was forced to tumble out on the floor, sometimes twice or thrice in the same night. It was attended with exquisite pain, bursting the small blood-vessels, which afterwards appeared of a livid hue for a considerable time.

" She

"She was intirely cured in a few days, by being electrified once a day, thus. Having taken off her shoes, she put one foot on the end of the chain, which came from the charged phial, putting the lower end of a wire to the other foot; so that this being touched, both legs might receive the shock at once." Mr. L. I never once knew it fail in this disorder.

16. *Deafness* rising from hardened wax, or following a fever, is cured by only drawing off sparks. This was frequently tried at *Upsal*. At *Stockholm*, a gentleman of distinction, who had been almost *deaf* a considerable time with a singing in his ears, was perfectly cured in three or four minutes.

A young man, who had almost lost his *hearing* for six months, by violent vomitings, which forced blood out of his ears, was perfectly cured in a few minutes.

Samuel Jones, gardener, at *Lambeth Marsh*, in the year of the great frost, leaped into the *Thames* to save a man from drowning. Hereby he became so deaf of both ears, that he could not hear any sound at all, were it ever so near, or ever so loud. In *February* last, after being once electrified, he could hear the noise of a coach at some distance. After the third time, he could hear the sound of the machine. He came no more; so it is supposed he is well.

A man, fifty-seven years old, who had been deaf for thirty-two years, was so far relieved in a few days, as to hear tolerably well.

A girl of seven, born deaf, (who consequently could not speak) began presently to hear words which were spoken very loud in her ear, and could repeat some of them in a few days.

I have known hearing hereby given to a man born deaf.

17. "In

17. "In May 1748, came to me one *Mary Smargins*, born in the island of *Nevis* in the *West-Indies*, 28 years old. She had been so *deaf* (from a cold at first) for seventeen years, as not to hear any one, unless they were very near and spoke loud. Her deafness had no intervals. She always heard the least with the left ear. On Saturday *May 28*, the phial being electrified by two turns of the wheel only, I applied one wire to the left temple, just above the ear, the other to the opposite temple. She felt a small warmth in her head, chiefly from ear to ear. I repeated it four times, a little stronger each time. The warmth increased at each shock, and tho' I struck her at each ear alternately, she always felt most warmth at the deafest ear. At last she complained of small twitchings in her ears, chiefly in that ear, and cross her head. No other part of her body felt the shocks. The warmth increased all day with twitchings at intervals. The next morning I repeated the experiment, which then affected her arms and body also. The twitchings were more violent; the warmth greater round the ears, chiefly the deafer ear. These effects continued all the day, and she heard considerably better. But toward evening, by sitting in an open window, she caught cold; on which the warmth left her, and she felt very chill all over her body. On Monday she was extremely ill, with pains all over her. On Tuesday she was much better, and felt the same kind of warmth round each ear again. On Wednesday the noise and beating in her head, which she had had from the first of her deafness, much abated. In the evening a violent shooting went across her head, from the left to the right ear. On Thursday I repeated the experiment. Some minutes after, blowing her nose, there issued corrupted matter with a small quantity of clotted blood.

E

blood. From this time she had little noise or beating in her head, and head perfectly well.

She had a great cold, and her eyes were much inflamed, when I began the experiment. But after the first day's experiment the inflammation decreased, and after the second, was wholly removed.

I was able at first to bear the strongest shocks. But after repeating them some weeks, I could hardly bear a small shock : and a strong one occasioned a violent convulsion of the muscles of my arm and body.

Upon rubbing with my hand a globe, while turning, I have several times felt a violent head-ach. But it always went off upon discontinuing the rubbing. I have known many persons, who found an unusual pain for some days after receiving the shock." Thus far Mr. *Wilson*.

I am surprized at this. For I never yet knew any person, man, woman, or child, sick or well, who found any such inconvenience. Only I have known rheumatic pains increase on the first or second trial, which were afterwards perfectly cured.

Mary Baker, chairwoman, aged 27, living at Mrs. *Hunt's*, in *Neal's Yard*, near the *Seven Dials*, having been long ill of a *Dropsy*, was admitted last year into *St. George's hospital*. But on *Nov. 28.* she was discharged out of it as incurable, as she was also from the *Westminster Infirmary*. In spring last she was electrified, and soon after parted with several gallons of water. After being twice more electrified she was well, and able again to earn her living.

18. It is of great use in the *Epilepsy* or *falling sickness*; unless it be hereditary, and then it does at least no harm.

The

The following case seems to have been of the epileptic kind. E----- T----- of Worcester was troubled with a very uncommon disorder, for ten or eleven years. The contraction usually began under her left breast, and darted thence to her right, and back again to her left breast and shoulder. It then struck down to her elbow, wrist and fingers, which were instantly so contracted, that if she had not time to catch up something in her hand, the nail of the fore-finger would so wound the thumb, as to make the blood run down. The contraction likewise twisted and drew her hand behind her, turning it up again to the shoulder. The intervals of this terrible disorder were uncertain: sometimes she had ease for a month; sometimes she was taken twice in a day. It would yield to no medicine, but was by this method entirely cured in a few weeks. She stood on the wire, coming from the phial, and then touched the apparatus with a finger of the hand affected. By this means the fire circulated the nearest way, through the body to the arm and fingers. This was several times repeated to each finger. Mr. L.

19. Sarah Bettefworth, aged 22, then living in Cow-Lane, was some years since seized with so violent fits, that five or six men were scarce able to hold her. In Autumn 1756, while she was in one of them, the Apothecary being asked by her master if he should electrify her? made light of it. However he did so, applying the bottle to one shoulder, as she lay on the ground, and the wire to the other. On the first shock her struggling ceased, and she lay still. At the second her senses returned. After two or three more, she rose in good health. Some months after she relapsed, and was electrified again, and again entirely cured. Last Easter she fell into a fit again, through a

fright, but by a few shocks was cured and restored to health.

William Matthews, schoolmaster, aged thirty-two, living at the *Foundery*, near *Moorfields*, had *Epileptic* fits (supposed to be hereditary) from his birth, till he was six years old. Thence he was free till thirteen. They then returned on occasion of a fright, and continued so to do twice or thrice in a year, till he was seventeen. From that time they came almost every month, till the Year 1753: since then they usually returned about once in ten or eleven weeks. In the middle of *March* last he began to be electrified, both through the head, and from head to foot. *April* 4. He had a slight fit, but from that time to this, *Nov.* 1, has had none at all. Can all *England* afford such a cure as this, wrought by a course of medicines?

20. “*John Webb* of *Worcester*, seventy years of age, was much *disordered in his feet* for ten or twelve years. The pain resembled that of the gout: and such a *coldness* attended it as was scarce supportable. If he warmed them by the fire, they raged still more, as also when they began to be warm in bed. The nails of his toes very frequently dropt off: the toes in general appeared livid; and frequently large black or bluish spots, were formed at the end of them, or on the top and sides of his feet. These, when they first came, were exceedingly painful; but after a time grew dry and hard. His heels likewise were generally puffed up like blown bladders.”

All these complaints gradually decreased, till they totally went away, by his being electrified once a day for some time, and afterwards twice a week. At first only sparks were drawn. Afterwards the chain was brought from the phial to the part affected of one foot; then one end of a
wire

wire was laid to the part affected of the other foot, and the other end of it brought to the conductor." Mr. L.

21. *Felons* are speedily cured by drawing sparks. If any disorder be superficial this operation suffices: but if it lie deeper, then the giving of shocks is found to be more effectual.

22. "Ann T----- had a *fistula* near the inner corner of her eye, which healed and broke again seven times. The last time it healed, it continued well for some time. After which it began with a small swelling, till it was as big as a fil-bird. From the time she was electrified, by drawing off sparks, it gradually decreased, till it was entirely dissipated." Mr. L.

Eliz. Johnson, daughter of Mr. Johnson, gun-maker in the Tower, was taken on *New-years-day* last, with sharp pains in her bowels, which soon threw her into *convulsion fits*. These returned five or six times a day, for ten or eleven days. She was electrified all over, and had no fit for eight months. She was then frightened into a fit. She was again electrified, and continues well.

23. "A young lady had been affected with *fits* near seven years, which seized her without any warning, and threw her flat on her face, quite insensible. These frequently returned twice in a day. This was attended with almost a continual *coldness* in her feet. Her stomach also was much affected. She stood upon a wire coming from the coat of the phial, and to complete the circuit, another wire was laid upon her head, by which means the fire was conveyed to that part. By this means both the *fits* and *coldness* were gradually removed, and a complete cure effected." Mr. L.

24. "Elizabeth B-----, near the *Old Hills*, a few miles from *Worcester*, had for fifty years been afflicted with severe *fits*. They threw her down to the ground, quite insensible, sometimes twice or thrice a day. She had tried many remedies, but to no purpose. From the latter end of the year 1752, she received several shocks. An inveterate head-ach, which attended her, quickly decreased, and in some months her fits too totally ceased." Mr. L.

25. Electricity was tried at *Upsal* in three cases of a *Ganglion*, which it perfectly dispersed.

26. Slight attacks of the *gout* are suddenly and effectually removed, by drawing sparks from the part affected.

"A person, who within the space of two or three years, had had several attacks of the *gout*, since the first of which, he had always a *stiffness* and *pain* in the joint of one of his great toes, and for a considerable time in both, was quite cured, by setting him on rosin, while one on the floor drew sparks from the diseased parts." Mr. L.

William Sinnock, cabinet-maker, in *Lombard-Court*, *Seven Dials*, was in *Feb.* 1758, seized with sharp pains in his feet, which continued three months, and for six weeks disabled him from doing any work. They returned in *February* last. He was electrified twice, and has felt no pain since.

Thomas Willis, chairmaker, aged 44, was for many years afflicted with the *gravel* in the kidneys. In *July* last he was electrified twice. After the second time he parted with a large quantity of gravel. He was electrified twice more, and has not found the least complaint since.

27. In very bad fits of the *Head-ach*, I have often, says Mr. L. used this remedy with surprising success.

"A

"A man of *Bromsgrove*, afflicted for near a fortnight with a violent and constant *head-ach*, was twice electrified by a few light shocks, with half an hour's interval, and entirely cured." Mr. L.

A—— T—— of *White-Chappel* had a violent head-ach, which continued for seven or eight weeks. After she was electrified the pain increased for three hours. It then gradually decreased, till she was quite well. This proves that it may remove even a disorder, which at first it seems to increase.

28. *Samuel Rennee*, aged seven, the son of *Richard Rennee*, weaver, living in *York-street*, by taking cold, was seized with a violent *head-ach*, which continued with short intermissions for above a year. Tuesday, *March 8, 1757*, he was moderately electrified all over. The pain left him from that hour.

29. "A man who had a fixed pain just above his eye-brow for several days, was by little shocks at the part, cured in a few minutes: so was Mr. *Higgins* of *Worcester*, of a *periodical head-ach*, which commonly began at five or six in the evening, and affected him from the top of his right temple to his ear, till he went to bed. This was cured only by drawing sparks." Mr. L.

"M——t D——s was afflicted with an almost constant, as well as violent pain in the *hinder part* of her *head* for near three quarters of a year; especially when she lay down in bed, being then so intolerable, she could not forbear shrieking. Having used many other means with no effect, she was electrified once a day. This presently relieved (sometimes by sparks, sometimes light shocks) and in some weeks perfectly cured her." Mr. L.

"E— T— was troubled for eleven years with a severe *head-ach*, which baffled all the efforts of
me.

medicine. By moderate shocks applied to her head, she was cured in a few weeks." Mr. L.

30. *Abigail Brown*, aged 22, then living in *Red-Cross-street*, was from a child frequently afflicted with a violent *head-ach*. In *October 1757*. she was electrified five days successively, having one wire applied to the fore part, another to the hinder part of the head, and receiving seven or eight shocks each time. Hereby she was entirely cured, nor has found any pain in her head since, unless occasionally for want of sleep.

Sarah Webb, wife of Mr. *Webb*, Tallow-chandler in *Grub-street*, aged 46, was from 20 years old subject to a violent pain on the top of her head. This frequently obliged her to keep her bed, nor could any remedy for it be found. In *December* last she received gentle shocks from temple to temple, and from the fore-head to the back of the head. This was done three days successively, and she was entirely cured.

31. *Richard Outen*, rope-maker, aged 23, living in *Bunhill-row*, was troubled with a violent *Head-ach* over the eyes, before he was ten years old, arising from a blow on the head. He was scarce free from it a month together for above 12 years. It used to throb and shoot thro' the head, so that often he was almost distracted. In *December 1756*, he was electrified once, receiving three shocks, by one wire, applied to the forehead, and another to the back of the head. He was worse than ever for some hours, till he went to bed, but awaked in the morning perfectly well: and has continued so ever since.

32. In deep *Hysterical* cases, the person ought to sit on the rosin at least half an hour every morning and evening. At first sparks may be drawn off; and afterwards shocks given, more or less, as the disorder requires. This would seldom fail

fail of the desired effect, as may well be supposed from the following instances.

" A young gentlewoman, about 10 miles from *Worcester*, sometime after she recovered from a fever, was seized with violent *hysterics*, which soon deprived her both of memory and understanding. The fire was conducted thro' her head by sparks and shocks several times a day, during the week she stayed at *Worcester*: in which time not only her memory, but her understanding was perfectly restored.

" *Mrs. Higgins* of *Worcester* was troubled for above ten years with an *hysterical* disorder, and a *coldness in her feet*. From thence that coldness moved gradually up to her head, in half a minute's time, which then seemed a palsy in the head. Soon after her teeth would chatter as in a violent ague. Thence the shaking proceeded to her arms, and whole body, and was so violent, (as *hysterics* mimic most distempers) as to resemble *St. Vitus's Dance*.

" Sometimes sparks were drawn, sometimes shocks were given; and she stood near half an hour daily on the rosin. In less than a fortnight the fits went entirely off: and in a while after, the coldness of her feet." Mr. L.

33. A person had rigid *knots* in the thigh like what appear in violent cramps, but not so hard or painful. These were entirely dissipated in a minute or two, only by drawing sparks.

34. One at *Upsal* who had *lost the use of his limbs* from cold, for several years, was in some weeks quite restored.

One at *Stockholm*, who had used crutchets for seven years, could walk without them in thirteen days.

Eliz. Buttle, nurse, aged 31, living in *Featherstone-street*, in May last, felt such a pain round her ankle-

ankle-bone, that she could scarce set her foot to the ground. This grew worse and worse for about a month. In June she was electrified seven times round the ankle, and thrice upon the knee. Immediately her *lameness* ceased, with the pain that occasioned it.

35. *Mary Lallo*, aged 25, then living in *St. Thomas the Apostle's*, when she was a child, was taken with a pain in the bone of the left leg from the knee to the bottom of the foot, which then felt as if a great weight had been fastened to it. This continued by intervals for many years. Frequently she could not walk without holding some one, and then in great agony. In *February 1757*, she received several small shocks on the knee, within four or five minutes. The pain instantly ceased. She walked home quite well, and has continued so ever since.

A girl also of 13, who after the small pox had been *lame* from four years old, having been electrified about twenty times, walked without a staff.

"A young lady from a strain in the knee-joint, or rather the crural ligament, was quite disabled from walking. About three quarters of a year after, when she came to me, the muscular part of the leg was much fallen away, and a continual *coldness* attended the foot."

"I ordered her to sit on the rosin at least half an hour daily, and to receive several shocks thro' the disordered part of the knee. The first month there was little effect. In the next there was a visible alteration for the better: the third, she could walk a few steps without any crutch or staff. In the following month, she seemed quite well, and left off electrifying: but after a time relapsed. After the relapse, the progress of the cure was more tedious, and it was four or five months

months before she could leave her remedy quite off." She was then totally cured. Mr. L.

36. " A young woman drinking at a cold spring when very hot, was seized with a kind of fever for a quarter of a year. Many red spots then appeared on her arms, and soon after a thin dry crusty substance which appeared rather as scales than scabs, from her elbows down to her fingers. This *leprous* disorder (which many call a *surfeit*) continued near three years. Indeed it lessened the first and second winter; but the third was the same as in summer."

" By drawing sparks once a day from the parts affected, in three weeks or a month, all the scales disappeared." Mr. L.

37. " A gentleman in *Worcester* had a *mortification*, which began in his toe, and in spite of all the means used, gradually increased. He was *shocked*, and the mortification stopped: but on his neglecting this, it began again; and increased so far that the case seemed desperate. Yet on his being *shocked* again thro' the mortified part, such a change appeared as astonished the surgeon, who owned it had done more good in two days than had been done in six weeks before." Mr. L.

38. A clergyman near *London* had from a child almost a constant *pain* in the lower part of his left side. He was once electrified by standing with his left foot on the chain, and has never felt the pain since.

James Kitely, of *Lambeth*, had a sharp *pain* in his left side about three years. After being electrified three or four times, the pain left him and came no more.

Mary Burgis living at the *Tun* in *Knaves-Acre*, had a *pain in her side* for seven years. In *May* last, she was entirely cured the first time of electrifying.

Michael

Michael Hayes, of *King-street, Westminster*, aged 86, had a violent pain in his left ankle for near four years. This sometimes disabled him from walking, which otherwise he could do without any difficulty. He was electrified thro' the part, and perfectly cured before he left the room.

39. *Eleanor Story*, living in *Clerkenwell Church-Yard*, catching cold, was seized with pain and weakness in the small of her back, as if it had been broke. By following the prescriptions of Dr. L. the pain after a fortnight settled in her shoulder. There it continued so violent, that often she had scarce any use of her arm. She afterward used abundance of remedies for above two years, but all to no effect. On Tuesday March 21, 1757, she received two strong shocks on each shoulder, which made the skin red and sore. That night she was in more pain than usual, trembled all over, and could get little sleep. The next morning she received several shocks all over, and so on Thursday morning and evening. After the second time her pain was gone, and she had the full use of both her arms.

John Reed, Cabinet-maker in *Warder-street*, was for six years afflicted with violent pains in the back of his neck. In spring 1758, he was electrified about thrice a week for a month, and quite cured.

40. *Joseph Jones* was taken about March 12. 1757, with a violent pain in the stomach. He received the same day a few gentle shocks. The pain went off, and returned no more.

Mary Pelteecree, warper, living in *Primrose-street*, was troubled six months with a pain in her stomach and back, accompanied with extreme weakness and faintness, which made her incapable of her work. By the advice of a physician, she took many medicines, but with no effect.

Five

five weeks ago she was electrified, receiving the shock through the stomach. This was done for five days successively. She has been perfectly well ever since.

H----- W-----, throwster, aged 23, living in *Fleetstreet, Bednal Green*, not being regular, was taken a year ago with a violent *pain in her stomach*. She had the advice of a physician, and took many medicines; but to no purpose. At length she was electrified, nine or ten days, and is in perfect health.

Ann Wild, of *Round Court*, by taking cold in childbirth, contracted a violent *pain in her stomach*. After it had continued four years, she was perfectly cured by twice electrifying.

Mrs. *Edwards*, living in *Nottingham Court, Short's-Gardens*, was ill of a *pain in her stomach* for eight years. It often took away her rest, as well as appetite, and brought her to the gates of death. By once electrifying she was cured.

Eleanor Taylor, mantua-maker, aged 48, living in *King-street, Oldstreet-square*, was taken in *September 1758*, with a violent *disorder in her stomach*, which felt as if it was ready to burst, and often made her sweat to her finger's ends. This continued for upwards of four months, and gave her little rest, day or night. In *February* following she was seized with the Rheumatism, throughout the left side. For this, having quite lost the use of her left arm, she came to be electrified. She felt the shock chiefly in her stomach, and her disorder there was cured. After three days she was electrified again, and cured of the Rheumatism also.

A gentlewoman in *London* had an almost continual *pain in her stomach*, more or less for eight years. She received one shock on her stomach, and was well from that moment.

41. *Silas Told*, schoolmaster, aged 48, living in *Christopher's Alley, Moorfields*, in the year 1741, had a Pleuritic pain, for which he lost an unusually large quantity of blood. Immediately he was seized with a strong *Palpitation of the heart*, which continued, more or less, without the intermission of one day, for more than sixteen years. In *February 1757* while I was electrifying for a *Pain in my stomach* (which was wholly removed by one shock) he came in and said, "My heart is very bad, and I think I will try it too." He did so, receiving a shock through the breast, and has been ever since perfectly well.

42. A citizen of *Upsal*, who was thoroughly *Paralytic*, was perfectly cured only by drawing sparks.

April 18th, 1756, a remarkable case happened at *Edinburgh*. *Robert Moubray*, in the beginning of *January* was struck with a *Palsy of the tongue*, and soon after entirely lost the use of his speech. Last week he began being electrified, and by *Saturday* he was able to put out his tongue, which before was dead and motionless. On *Monday* he could speak a little, and on *Tuesday* he could speak as well as ever.

Thomas Dobson, leatherpipe-maker, aged 27, living in *Barnaby street*, was seized with a *Palsy in the tongue*, on *July 24th* last. It grew worse and worse till *Saturday 28*, and then quite deprived him of his speech. He was electrified for five days, by drawing sparks from the tongue, and shocking him all over. And hereby not only his palsy was cured, but convulsions also, which he had had for four years.

"Mr. P. had a year or two ago a slight touch of a *Palsy*. On a sudden his arm dropped down, quite without strength; and tho' after chafing it well, he recovered the use of the upper and middle

dle joint, yet the lower part was still so weak, that he could by no means write his name. But by a few shocks in the arm he was effectually relieved.

“The same person had lately a much worse stroke. All his right side was so affected, that he could not walk without two to support him. After he had been electrified three times, he could walk with the support of one only, and in a short time he was perfectly well.” He used to stand on the chain with the right foot, and touch the apparatus with his right hand.” Mr. L.

I have not yet known any instance of this kind. Many *Paralytics* have been helped: but, I think, scarce any *Palsy* of a year standing has been thoroughly cured.

43. A gentlewoman in *London*, who for several years was never long together without sharp pains in her knee, which seemed chiefly *Rheumatical*, was freed from them in a moment by one single shock.

John Ramsay, cabinet-maker, living in the *Strand*, by being very wet, caught a violent cold, in the latter end of *June 1756*. This occasioned a *Rheumatic Pain*, which fixed in his left knee. From this he was seldom free for a week together till *November*. He was then very ill till *February*, being seldom able to do above half a day's work, sometimes none for a week together. He was for ten weeks an out-patient of *St. George's Hospital*; but received no benefit. On *Monday 21st March* he was electrified through the knee, and four times more within seven days. The pain was removed, and his sleep, which had been long lost returned, as before he was first taken.

Ann Walter, servant, aged 22, then living in *Brick-Lane, Spittlefields*, was cured entirely of a

violent *Rheumatism* in her left arm, by being electrified five times.

A stone-cutter at *Stockholm*, whose knees and joints of his toes had been rendered stiff, and his fingers crooked by a mixture of Gout and *Rheumatism*, after being electrified a few days, was able to go to work. It has been found to remove or greatly abate all *Rheumatic* pains.

Ann Cambell, living in *Queenstreet*, *Seven Dials* had a severe *Rheumatism* fourteen weeks. For nine weeks she could not dress herself, nor get out of bed without help. She had the advice of several physicians, but in vain. In spring, 1758, she was electrified five times, and thereby restored to full health.

William Tyler, living at the *Sun* in *Long-lane*, *Smithfield*, was on *March* 9th last, about three in the morning, seized with *Rheumatic* pains, chiefly on his right side, so violently, that he was as helpless as an infant, and was frequently constrained to shriek out, like a woman in labour. I came before nine. After the second shock he felt some change: after the third he was able to raise himself a little. After two more he rose and walked about the room, and before noon he was quite easy and well.

Sarah Guildford, aged 37, living on *Saffron-hill*, was for upwards of seven years so afflicted with the *Rheumatism* in her right side, that the knee and ankle were wasted exceedingly. *January* 2d last she was electrified, and perfectly cured in one day. But it threw her into a profuse sweat particularly from those parts which had been most affected.

Ann Cardiff, servant, at the *Golden Head*, *Islington*, aged 40, about sixteen years ago, was taken with a violent *Rheumatism*, by catching cold in lying in. It returned every year, and the last
win-

winter took away the use of her limbs. She followed the advice of several physicians, till they pronounced her incurable. October 15 last she was electrified, first by general shocks, then thro' the parts most affected. The first and the second time it made her extremely weak and faint. The third time she was better, and after nine times all her weakness and pains were gone.

Margaret Virgin, silk-winder, aged 39, living in *White-Horse-Yard, Seethin-Lane*, was troubled with the *Rheumatism* before she was ten years old, and more and more till when she was about twelve she was confined to her bed for near 21 weeks. From that time she was seldom free from it, so that many times she was quite incapable of business. Last winter she was so ill as to be forced to quit her work, not being able to lift an arm to her head. In *January* she was electrified twice: the first time all over: the second time thro' the left arm. The use of her arm was immediately restored. Her pains entirely left her, and ever since she has been more capable of any kind of work than she had been for twenty years.

Mary Trumbel, of *White-Cross-street*, aged 49, began to be afflicted with the *Rheumatism* before she was 30 years of age. It returned in her shoulders or head every winter: and for the three winters last past so increased, that she could by no means turn either arm behind her, and was extremely painful. Last winter it was worse than ever. A little before Christmas she received five or six small shocks. Immediately she was easy, recovered the full use of both arms, and has retained it ever since.

William G. of the *Little Minories, London*, had been violently afflicted with the *Rheumatism* for many years. For several winters he was not able

to work. But after having received a few shocks in a quarter of an hour, all his complaints vanished away, and he was afterwards as well in winter as in summer.

44. Almost all kind of *Inflammations*, *Ring-worms*, *Tetters*, *Shingles*, as well as most kinds of *Swellings* may be totally cured by drawing sparks only.

45. A lad at *Stockholm*, who had a severe *Sciatica* in the right hip, so as not to bear being touched, was cured in a few days.

John Ellison, then an officer of excise, living in *Hunt-street*, *Spittlefields*, was upon catching cold, seized with a violent *Sciatica*, which held him several months without intermission, and frequently almost took away the use of his limb. In *August* 1754 he was electrified, receiving two shocks. His pain raged the more for four or five hours; but afterwards entirely ceased. And from that time to this he has been perfectly well, without the least relapse.

" Mr. R----- S----- of *Worcester*, troubled with a *Sciatica* for some years, was cured at once by shocks conveyed to the parts affected. Mr. L.

Mary Butler, aged 86, living in *Eagle-street*, *Redlion-square*, having been afflicted with the *Sciatica* for more than twenty years, was last month electrified ten or twelve times, and has been easy ever since.

It seems the electric fire in cases of this and of many other kinds, dilates the minute vessels, and capillary-passages, as well as separates the clogging particles of the stagnating fluids. By accelerating likewise the motion of the blood, it removes many obstructions.

46. *Thomas Nevil*, weaver, aged 26, living at the Bottom of *Vine-Court*, *Spittlefields*; when about 16 years of age, *sprained* his loins so violently,
that

that from that time he found a continual weakness, frequent pains and an inability to do any hard work. On Thursday, *March 10th, 1757*, he was electrified, receiving five or six shocks thro' the parts affected. When he went home he felt no pain, but much soreness on the part, on which a red spot appeared, like a small pin's head. But the next morning he was perfectly well, and has been ever since stronger than before the first hurt.

Francis Halfpenny, Taylor, aged 30, living in *Redcross-street, Southwark*, when about 18 years old had a fall from a tree. By this he received such a sprain, that he could not walk twenty yards, unless exceeding slow, without a gnawing, aking pain down his thigh. About the middle of *September* last he was electrified thro' the upper part of the thigh. This was repeated at five or six different times. The first shock removed the pain down to the knee. At the third electrifying it went quite away. And since that time he has been full as well as he was before his fall.

47. " *E--- H---*, of *Tedny*, had a very painful swelling in the ball of her great toe for some years. Having made use of many other means in vain, she was at length electrified. After the first operation (by drawing sparks) the pain was much abated: and in a short time the swelling disappeared and the pain left her,"

" *Mr. Joshua W---*, of *Pershore*, was troubled for seven or eight years with a pain in his second toe. Tho' nothing was to be seen, it was as tender as a boil, and the pain was so great, particularly in walking, that he at length determined to have it cut off. By drawing sparks he was cured in an hour."

" A gentleman of *Worcester* ran a bodkin into the side of his hand, near the fore and middle fingers.

gers. The wound was no more than a prick of a large pin, yet in three or four days a *swelling* came both in the palm and on the back of the hand.

" The fifth day a surgeon was called, who for three months dressed both the inside and the outside of the hand to no purpose. A caustic was then applied: but with no more success than all the other means.

" Finding no alteration, nor likelihood of any, he was electrified twice (by drawing off sparks) on the inside of his hand, at the bottom of the middle finger. In four days it broke, and in about three weeks healed. Mr. L.

Jane Davison, Quilter, aged 26, living in *Quaker-street*, had about six years ago a violent tooth-ach, which occasioned a *swelling* in her right cheek. This continued gradually increasing on the inside of the cheek, till it grew into an hard fleshy lump. Despairing of any help, she let it alone, till last month she was persuaded to be electrified. She received several strong shocks thro' the part. After this was done the first time, the swelling not only increased exceedingly, but was violently painful. The next day, the other cheek likewise swelled, and that swelling spread thro' the upper lip, across the mouth. Nevertheless she was electrified again. Two or three days after it broke, and for two days together, discharged abundance of purulent matter mixt with blood. But in a few days the wound was entirely healed, and all the swelling gone.

48. " *E-----T-----*, taking cold, was seized with a *fore throat*, which grew worse and worse for six days. She then could not swallow even a bit of bread soaked in tea. The same morning she was electrified, so as to direct the shock in a right line thro' the part affected. By the time she got home she

she could eat any thing. Two shocks more made a perfect cure."

49. "The *tooth-ach*, if proceeding from a scorbutic habit, from hollow teeth, or from a de-fluxion of rheum, is presently assuaged or totally removed by this remedy.

"This may frequently be done by drawing sparks from the tooth or cheek: in more stubborn cases, by moderate shocks. The sooner you touch the phial, the weaker the shock: so that you may lessen or increase it at pleasure.

"In giving the shock the most effectual way, is, to bring one wire under the chin and tooth; (if it be on the under side) and lay the end of the other wire on the top of the tooth. If it be on the upper side, bring one wire to the top of the head over the tooth, and apply the other to the bottom of it. Mr. L.

Sarah Ellison, the wife of *John Ellison* above-mentioned, caught cold in lying in, which fixed a sharp pain in her *teeth*, and the side of her face. She used all manner of means to remove this for upwards of six years. Among many others, she had at several times, three teeth drawn, and was fourteen times blistered, but without effect. In *July 1754*, she received six shocks thro' her head. The pain ceased immediately, and returned no more.

50. "A person had a swelling, supposed to be a *wen*, between the neck and the shoulder-blade as big as an egg, and nearly as hard, which had been growing to that size for several years. She had not been electrified many times (by drawing sparks for five or six minutes every day) before it began to soften. Soon after it discharged a thin humour thro' a small orifice, and continued discharging and softening more and more, till it was entirely dissipated." Mr. L.

51. Who-

51. Whoever desires to see a more circumstantial account of many of the preceeding cases, with the names of most of the patients and their places of abode, may consult Mr. *Lovett's* treatise. It is wrote not only with admirable judgment, but with an excellent spirit. A principle of benevolence to human kind may be easily observed to breathe thro' the whole: nor can any lightly condemn it, but those whose interest naturally leads them to decry whatever would lessen their own gain.

52. After relating these cures, Mr. *L.* himself adds, " I can't deny but I was almost astonished, at seeing such mighty things performed by electricity. But after having attentively considered the nature of electric ether, its great subtilty and power, its active and enlivening qualities, and its mighty tendency to accelerate the motion of the fluids in general, and of the blood in particular : " (I would add, and to pervade the finest arteries and nerves, to dilate their obstructed or contracted orifices; as well as to restore the tone of any muscle or fibre, which is either impaired or destroyed :) " I concluded that all those surprizing effects were no more than the necessary consequences of so powerful an agent, when thus determined, and directed. And the helping us in our bodily infirmities, was *one* great end it was ordained to serve," (probably *the* great end) " after it had been thus fully and plainly discovered to us."

53. It were greatly to be wished, that the gentlemen of the faculty would strictly examine the nature, properties, and effects of this sovereign remedy. For such it unquestionably is, particularly in nervous cases; even in those cases, which the common *Materia Medica* will in no wise reach. But it is not to be expected. They must not disoblige their good friends the apothecaries. Neither

can it consist with their own interest, to make (altho' not every man) yet so many men their own physicians, which would be the unavoidable consequence, if a regular system of practical rules were formed from a process of experiments, whereby a sensible man might judge in what cases it would cure, and in what not: and in what manner it might be most effectually applied in any case wherein it was proper.

In order to prevent any ill effect, these two cautions should always be remembered. First, let not the shock be too violent; rather let several small shocks be given. Secondly, do not give a shock to the whole body, when only a particular part is affected. If it be given to the part affected only, little harm can follow even from a violent shock.

For instance. In a *palsy of the tongue*, the shock may be given to the tongue only by applying one wire to the hinder part of the neck, and another to the tongue. And if in any case there be danger of too great a shock, it may easily be prevented.

It is highly probable, a timely use of this means might prevent before they were thoroughly formed, and frequently even then remove some of the most painful and dangerous distempers: *cancers* and *scrophulous tumours* in particular; tho' they will yield to no other medicine yet discovered. It is certain, nothing is so likely, by accelerating the contained fluids, to dilate and open the passages, as well as divide the coagulated particles of the blood, that so the circulation may be again performed. And it is a doubt, whether it would not be of more use, even in *mortifications*, than either the bark or any other medicine.

Before I conclude, I would beg one thing (if it be not too great a favour) from the gentlemen of the faculty, and indeed from all who desire health

health and freedom from pain, either for themselves or their neighbours. It is, That none of them would condemn they know not what: that they would hear the cause, before they pass sentence: that they would not peremptorily pronounce against electricity, while they know little or nothing about it. Rather let every candid man take a little pains, to understand the question before he determines it. Let him for two or three weeks (at least) try it himself in the above-named disorders. And then his own senses will shew him, whether it is a mere play-thing, or the noblest medicine yet known in the world.

F I N I S.